Mathematical Modeling Continued

Since step 2 is not explicitly included in the Maria paper, a different approach was used to determine the equation. During our literature search, we did not find any primary publications that specify the methylmercury conversion behavior of both MerA and MerB. Our pBBRBB plasmid is designed in the way that the mer genes are induced in the presence of methylmercury and ionic mercury. Through our literature search, we were able to calculate the steady state concentrations of basal and induced states based on the presence of methlymercury and ionic mercury in the cytosolic space. Therefore, we used the below equation to extrapolate the reaction rates of both the mer proteins.

$$\frac{d[MerA_{induced}]}{dt} = B' + \frac{V_a[Hg^{2+}]}{K'_m + [Hg^{2+}]} - k_{deg}[MerA_{induced}]$$

$$\frac{d[MerB_{induced}]}{dt} = B + \frac{V_b[CH_3Hg+]}{K_m + [CH_3Hg+]} - k_{deg}[MerB_{induced}]$$

The above equations show the reaction rates of the mer proteins under induced steady state. To represent the full MerA and MerB expression, we include terms for the basal protein expression, the induction of the Mer proteins, and the degradation of proteins. For details on the calculations, please refer to **Supplemental Materials A**. We have determined from our calculations that Va and Vb resemble Vmax in the equations.